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ABSTRACT

This personnel research report basically represents a consolidation of three research working papers designed to enumerate the quantitative Navy manpower requirements for various proposed candidate configurations of a new Hydrographic Survey Ship System (AGS). Included is a description of the various AGS candidate proposals and a breakdown of the estimated personnel requirements, in preliminary qualitative terms, for three major subdivisions of the total ship system, which include: (1) embarked survey vehicles, (2) embarked survey team, and (3) ship control. The information contained in this report has been designed to assist in the development of the AGS PTA and also to provide project and cognizant BUPERS personnel planning divisions with the projected quantitative Navy manpower implications of the AGS development program. (Author)

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NAVAL PERSONNEL AND TRAINING RESEARCH LABORATORY

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INTERIM QUANTITATIVE MANPOWER PROJECTIONS FOR PROPOSED HYDROGRAPHIC SURVEY SHIP SYSTEM (AGS) CANDIDATE CONFIGURATIONS (NAVSHIPS Subproject S46-27012, Task 14408)

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A LABORATORY OF THE BUREAU OF NAVAL PERSONNEL

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INTERIM QUANTITATIVE MANPOWER PROJECTIONS FOR PROPOSED HYDROGRAPHIC SURVEY SHIP SYSTEM (AGS) CANDIDATE CONFIGURATIONS (NAVSHIPS Subproject S46-27012, Task 14408)

by

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October 1969

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Research Memorandum SRM 70-10

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SUMMARY

A. Problem

To provide timely quantitative Navy personnel planning information for inclusion into the AGS PTA, Sections 5 and 8, and to assist in the analysis of proposed AGS ship system candidate configurations in terms of manpower cost and effectiveness trade-off considerations.

B. Background and Requirements

The AGS development program was initiated during the 3rd quarter of FY 1968 and is currently progressing through the Concept Exploration Phase of Concept Formulation. The HYSURCH is a parallel research and development effort being conducted by NAVOCEANO and is expected to provide for the development of survey equipment from which AGS ship design requirements and characteristics are to be determined.

The NPTRL personnel research effort was initiated in January 1969 to provide preliminary personnel planning data to the AGS Project Director (NAVSEC) for the development of PTA personnel cost and effectiveness data.

C. Approach

The selected NPTRL research approach has been to divide the overall AGS ship system into three distinct subdivisions consisting of: (1) embarked survey vehicles, (2) embarked survey team, and (3) ship control. This approach has allowed for the development of three separate Navy detachments capable of being employed individually or as an integrated part of a military and civilian (MSTS/NAVOCEANO/contractor) manned ship system.

D. Conclusions

1. A three section survey vehicle crew rotation or equivalent will be required for continuous 24 hour operations during an AGS emergency mission.

2. Personnel planning for AGS emergency mission time constraints represents a major obstacle in achieving optimum personnel utilization effectiveness.

3. New NOBCs/NECs will be required for HYSURCH related Navy billet assignments.

4. A continuing personnel research effort will be required to review and update the quantitative Navy personnel data developed to be consistent with

program changes and configuration selection decisions. In addition, this effort must be attentive to the development of qualitative personnel requirements and the establishment of effective personnel utilization guidelines.

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I. INTRODUCTION

A. General

The information contained in this personnel research report has been developed in response to the Hydrographic Survey Ship System (AGS) Ship Development Objective (SDO) (3) and Concept Formulation Plan (CFP) (Task 2.4.7) (14) and has provided for the development of preliminary Navy personnel planning data for inclusion into the AGS Proposed Technical Approach (PTA), Sections 5 and 8. More specifically, this report presents an outline of projected Navy quantitative manpower requirements for various organizational subdivisions and alternative design configurations of a new construction AGS ship. These projections also include preliminary estimated quantitative personnel requirements for the Hydrographic Survey and Charting System (HYSURCH) (H37-10X).

The primary objective of the AGS development program is to formulate specific requirements for, and characteristics of, a new type of hydrographic survey ship. This ship is to be capable of logistically and operationally supporting and deploying the HYSURCH concept in the acquisition, processing, and compilation of hydrographic survey data resulting in the production and distribution of usable multi-colored combat charts within a specified time frame. The HYSURCH concept is an advanced hydrographic survey and chart production system design that is expected to significantly increase present hydrographic data acquisition rates. In accomplishing this end, the HYSURCH system will incorporate high speed data acquisition and computerized data handling and survey control techniques which provide a high degree of close operational control and mission coordination that far exceeds current AGS ship capabilities.

The combined AGS and HYSURCH mission is to rapidly conduct hydrographic survey of a predetermined area for purposes of providing useful hydrographic data to operational planners and tactical commanders in order that they may take optimum advantage of hydrographic conditions in the employment of their forces. Additionally, these systems are to have the capability for rapid and economical surveying of coastal areas to support general maritime operations. Within the overall mission parameters, an SDO goal for emergency combat operations has been specified which requires that the AGS/HYSURCH systems be capable of surveying an area approximately 70 miles long by 15 miles wide and completing initial setup, survey, and chart production operations within a 5-day period. More recently, during Concept Formulation planning, this goal has been expanded to include emergency mission times of 10 or 15 days in order to more effectively analyze system trade-off possibilities relating to total system performance, cost, complexity, and size.

The reduced reaction time and increased control capabilities gained through the automation of survey functions in the HYSURCH system, coupled with an AGS emergency mission requirement, has precipitated the inclusion

of greater numbers of survey vehicles into overall program planning to more fully utilize the rapid area coverage potential of this new hydrographic surveying system. These innovations have also increased the desirability of adapting high-performance surface craft (Hydrofoils - Air Cushion Vehicles) and/or helicopters to the hydrographic survey data gathering mission. Under present planning guidelines, the HYSURCH system may employ upward of 30 various platforms in different combinations to accomplish the surveying tasks. When compared to the four conventional survey boats and two support helicopters carried by the largest of the present-day AGS ships (T-AGS-29 class), the magnitude of possible support ship survey vehicle handling and stowage requirements has become a major trade-off consideration in the determination of final AGS system characteristics.

Table 1 presents a list of 13 survey vehicle systems consisting of 39 separate vehicle configurations currently under investigation within the three AGS emergency mission time constraints. These systems represent the results of AGS Concept Formulation support studies conducted to explore the feasibility and requirements of possible survey vehicle candidates. The survey vehicle configurations presented here represent a select few which are operationally capable of conducting and completing the survey mission within the specified time constraints, given adequate personnel and mission support. It is noted that the 13 systems outlined here encompass a wide range of support ship design requirements which change somewhat in size and complexity from system to system and mission to mission. In order to more adequately evaluate these alternative survey vehicle candidates in terms of overall cost and effectiveness, alternative AGS ship design proposals have also been developed. For ship control manning estimates, the design alternatives used in this report have been grouped at what may be considered the two extremes between the largest and smallest AGS support ship configurations consistent with existing design proposals and include: (1) a small diesel-powered ship (3,600 shp) displacing approximately 4,200 tons; (2) a large diesel-powered ship (up to 22,000 shp) displacing approximately 10,000 tons; (3) a small steam-driven ship (6,000 shp) displacing approximately 6,500 tons; and (4) a large steam-driven ship (22,000 shp) displacing approximately 17,000 tons. Although these four ship design candidates are not all inclusive for development planning purposes, they comprise a representative sample of the hull types and propulsion systems under consideration and have allowed for the projection of preliminary quantitative personnel figures.

The ship design proposals and 39 survey vehicle configurations considered in this report provide a great deal of flexibility in system planning and offer numerous AGS mission effective combinations from which to select a final system design. The remaining problems are those which deal with verifying the technical feasibility of adapting the high-performance surface craft and/or helicopters to the survey tasks and achieving an optimum survey vehicle spread between normal and emergency AGS missions within acceptable cost parameters.

TABLE 1

Embarked Survey Vehicle Configurations Required for Proposed AGS Emergency Mission Time Constraints

System	Type and Number of Survey Vehicles Required for *		
	5 Day Mission	10 Day Mission	15 Day Mission
I	A-33	A-14	A-9
II	B-17	B-7	B-5
III	C-18	C-8	C-5
IV	D-16	D-7	D-5
V	F-14	F-6	F-4
VI	A-8/F-9	A-4/F-4	A-4/F-3
VII	B-4/F-9	B-3/F-3	B-2/F-3
VIII	C-4/F-9	C-3/F-3	C-2/F-3
IX	D-5/F-8	D-3/F-3	D-2/F-3
X	A-13/HT-23	A-6/HT-9	A-4/HT-6
XI	B-8/HT-20	B-4/HT-7	B-3/HT-6
XII	C-8/HT-22	C-4/HT-8	C-3/HT-6
XIII	D-8/HT-20	D-4/HT-7	D-3/HT-6

Identification of Survey Vehicles Type

A - 31' River Patrol Boat (PBR Type)
B - 48' Planing Boat
C - 51' Sidewall air cushion (HM-2)
D - 39' Skirted air cushion (SK-5)
F - 43' Hydrofoil
HT - 53' Helicopter (UH-1)

*3 HELOS (HT) for 5 day emergency mission and 2 HELOS (HT) each for 10 and 15 day emergency missions will be required for support purposes in addition to numbers shown in this table. 2 additional LCVPs not shown in this table will also be required by all system configurations for support purposes (see page 12, item 7).

B. Purpose and Approach

The purpose of this personnel research report is to provide project and cognizant Bureau of Naval Personnel (BUPERS) personnel planning divisions with the projected quantitative Navy personnel implications of selected AGS ship system candidates. The personnel research information contained herein is basically a consolidation of three previous Naval Personnel and Training Research Laboratory (NPTRL) (formerly Naval Personnel Research Activity (NPRA)) personnel research Working Papers (15, 16, 17) which were developed in support of the AGS Concept Formulation Plan and organized into three separate parts to accommodate the three major subdivisions of the AGS ship system which include: (1) embarked survey vehicles (surface and helicopter), (2) embarked survey team, and (3) ship control. This three-part research approach was selected to complement the current AGS manning philosophy which provides for the utilization of either Navy and/or civilian Military Sea Transportation Service (MSTS)/Naval Oceanographic Office (NAVOCEANO) personnel in the three major areas of the total ship system. Additionally, civilian contractor personnel are being considered for support helicopter requirements. The advantage of this research approach has been to allow for the development of three self-sufficient Navy detachments that could be employed effectively as a single unit, making up the total AGS ship allowance, or in part, as either ship's company or a detachment aboard an MSTS/NAVOCEANO controlled ship. In this regard, numerous manning alternatives exist that could be facilitated simply by manipulating the various Navy manpower projections contained herein to arrive at a desired personnel arrangement. For example, a manning alternative has been suggested that would replace the Navy survey vehicle equipment operators with NAVOCEANO personnel who would then become part of the survey team vice the survey vehicle team as outlined in this report. This alternative would merely require subtracting the Navy survey vehicle equipment operators from the appropriate tables to obtain the revised personnel estimates for the embarked survey vehicle team. The remaining Navy personnel figures would be unchanged.

In developing the estimated Navy manpower requirements information for the three stated areas of the AGS ship system, the following procedures were used:

1. Pertinent AGS and HYSURCH materials and documentation were reviewed and used in development of personnel related task requirements.

2. Manpower Authorization documents (OPNAV Form 1000/2) for five candidate related Navy ship types were acquired and reviewed for purposes of establishing a comparative base for determining personnel task assignments. These ship types included the USS CONCORD (AFS-5), USS ST LOUIS (LKA-116) USS FRESNO (LST-1182), USS MAURY (AGS-16), and USNS CHAUVENET (T-AGS-29).

3. Personnel interviews were conducted with representatives of appropriate activities located in the Washington, D. C. and San Diego, California areas to verify and compile task related data. These included:

Washington, D. C. area

(a) Naval Ship Engineering Center (NAVSEC)
(b) Bureau of Naval Personnel (BUPERS)
(c) Naval Oceanographic Office (NAVOCEANO)

San Diego, California area

(a) Commander Amphibious Force Pacific Fleet Representative (COMPHIBPACREP) and Commander Service Force Pacific Fleet Representative (COMSERVPACREP) at the Enlisted Personnel Distribution Office Pacific Fleet (EPDOPAC)
(b) Helicopter Combat Support Squadron Three (HELSUPPRON-3)
(c) Boat Support Unit One (BOATSUPPU-1)
(d) Navy Maintenance Management Field Office West (NAVSHIPS 0411W)
(e) Fleet Air Photographic Laboratory (FLEAIRPHOTOLAB)
(f) Light Photographic Squadron Sixty-three (VPF-63)
(g) USS PICKAWAY (LPA-222)

Additional associated system and personnel utilization data were obtained through a review of pertinent Chief of Naval Operations and BUPERS personnel and training guideline publications and participation in the AGS Concept Formulation Coordinating meetings (7, 9, 10, 11, 13, 19).

C. Background

The AGS development program was initiated during the 3rd quarter FY 1968 with the forwarding of a draft AGS Ship Development Objective (4) based upon Advanced Development Objective (ADO) 46-27X (5) to the Chief of Naval Operations (CNO) by the Office of the Oceanographer of the Navy (OCEANAV). AGS Concept Formulation began during the 1st quarter FY 1969 with the issuance of the Hydrographic Survey Ship System (AGS) Concept Formulation Plan (CFP) (14) and is currently progressing through the Concept Exploration phase of Concept Formulation. Concurrently, a parallel research and development effort for the HYSURCH system is being conducted by the U. S. Naval Oceanographic Office (NAVOCEANO) (2). This effort relates directly to AGS Concept Formulation and is expected to provide for the development of survey equipment from which AGS ship design requirements and characteristics are to be determined.

The initial NPTRL personnel research effort began in January 1969 and has been concerned primarily with providing timely quantitative Navy manpower data to the AGS Project Director (NAVSEC 6111) to assist in PTA development. Under current program planning guidelines, the AGS ship system may either be entirely civilian (MSTS, NAVOCEANO and contract employees) or be a combination of civilian and Navy personnel (6, 18). The NPTRL research effort has been concerned only with providing Navy manpower estimates to allow for the integration and evaluation of each alternative system proposal with corresponding Navy personnel planning information for the establishment of preliminary cost and manpower trade-off data. In this regard, similar studies concerning civilian manpower requirements are being conducted by NAVOCEANO and MSTS respectively.

D. Limitations

As previously stated, the scope of this research report has been restricted primarily to the development of quantitative Navy manpower data relating to the three major subdivisions of the AGS ship system. The development of these specific data are normally based on known or proposed system design characteristics. Inasmuch as the AGS system is in the Concept Formulation phase of system development, several AGS design configurations are still eligible for final selection. The nature of these design proposals is such that the quantitative personnel estimates for the separate survey vehicle configurations contained in Table 1 can be combined with quantitative personnel data for appropriate size and type related ship candidates and survey team requirements to arrive at total AGS manning figures. This report separately outlines the estimated Navy manpower requirements for each of the proposed survey vehicle configurations as well as the HYSURCH survey team and four representative ship candidates previously described. To combine these data and attempt to develop all possible personnel allowances for these 39 survey vehicle configurations and four ship types would obviously be quite cumbersome and is considered to be beyond the scope of this research effort. Aligning the survey vehicle configurations with the appropriate ship types remains as a task for future program definition.

The selected research approach which has been concerned with developing an operationally self-sustaining Navy detachment for each of the three AGS subdivisions has certain inherent limitations that can be resolved only with the selection of a final system design. These limitations are of an organizational nature and refer to the overlapping of certain officer and enlisted billet assignments between the three major subdivisions. Under the "MSTS/NAVOCEANO or Navy" manning philosophy, the organizational structure developed requires that Navy personnel assigned to each subdivision be capable of providing all necessary operational, administrative and maintenance support for that subdivision. If total Navy manning was the system goal, it is believed that a consolidation of certain personnel requirements could be accomplished to reduce the overall quantitative figures contained herein. Although initial attempts have been made to integrate various deck, engineering (repair) and administrative support personnel requirements, these attempts must be considered tentative until more in-depth personnel integration studies based on selected system design characteristics and a singular manning concept can be undertaken.

A specific limitation of the current AGS personnel research effort lies in the development of survey team personnel planning information. This has been caused primarily by a lack of usable Navy personnel-related HYSURCH system data. Initial investigations have revealed that the differences between the HYSURCH system and existing survey equipment, and the possibility of total Navy manning in this area where civilian experts are presently being utilized, is of such significance that a direct extrapolation of personnel requirements from existing AGS allowances becomes inappropriate. Currently, much of the available HYSURCH personnel planning data is in the form of limited, equipment oriented, civilian occupational titles containing gross estimates of numbers and shifts required for 24-hour operations. The Navy personnel planning information contained herein represents a

transposition of these gross HYSURCH estimates and the current manning figures for related AGS ship types, viz, USS MAURY (AGS-16), USS TANNER (AGS-15), USNS CHAUVENET (T-AGS-29) and USNS HARKNESS (T-AGS-32), into a Navy Survey Team believed capable of meeting AGS emergency mission task requirements. A refinement of these estimates will require an in-depth study of the personnel requirements for the HYSURCH system and the development of specific task related Navy billet codes to replace civilian job descriptions where considered feasible and/or desirable. Currently, conversion studies are underway that are investigating the possible inclusion of HYSURCH into the T-AGS-29. The personnel planning data contained herein is considered to be basically applicable to this program; however, refinement of these data based upon specific program requirements will be necessary to provide complete and accurate system manpower figures. This information, when required, will be forwarded as a supplement to this report.

Where listed, Navy Officer Billet Classifications/Navy Enlisted Classifications (NOBC/NEC) codes are indications of the Navy training (regular or special) that is, or appears to be, closely associated with a given task. However, the personnel information contained herein is primarily quantitative in nature and provides only initial AGS/HYSURCH system personnel training implications. More specific system personnel training requirements information will be developed at a later date.

E. Assumptions

The underlying assumptions upon which the personnel planning data contained in this report are based cover a wide range of ship, survey vehicle and HYSURCH system design and mission requirements that have remained open to interpretation and clarification. Such factors as crew endurance, on-station time requirements, degree of maintenance support required, equipment operator vigilance requirements, survey vehicle handling techniques to be used, and the degree of automation that can be achieved throughout, are all important contributors to the development of accurate quantitative personnel information. In this regard, the single most significant obstacle to be confronted relates directly to AGS emergency mission requirements. For 24-hour operations, survey vehicle crew and survey team personnel will require relief regardless of equipment reliability and endurance. The manner in which relief personnel are provided and the number of personnel required to ensure safe and efficient system operation is a prime consideration in establishing system cost effectiveness. The interpretations and assumptions used in developing the quantitative personnel figures contained in this report will be discussed separately within sections dedicated to each of the three major subdivisions of the AGS ship system.

II. PROJECTED AGS SHIP SYSTEM NAVY MANPOWER REQUIREMENTS

In meeting the overall objectives of the current AGS personnel research effort, this chapter has been divided into three sections which separately discuss the projected manpower requirements for the three major subdivisions of the AGS ship system. Each of these three sections speaks directly to the various alternative system candidate proposals within these major subdivisions and represents a condensation and/or consolidation of the data contained in Appendices A through F. The Appendices are basically the results of previous NPTRL field research and were developed specifically for each individual system candidate, e.g., Appendix A presents the projected operation and maintenance personnel requirements for up to 15 ten-ton hydrofoil craft.[1] These data were then fitted to those of the 39 candidate survey vehicle configurations contained in Table 1 proposing the use of hydrofoils and further combined with similar data related to other survey vehicle candidates (Appendices B through D) to arrive at the total manpower requirements for that specific survey vehicle configuration. This basic consolidation procedure was followed throughout the development of Section A while Sections B and C are primarily the amplification for, and condensation of, the data found in Appendices E and F.

The sum totals for these numerous data transfigurations are presented in Table 2. This table presents the cumulative manpower figures for each system candidate and allows for the analysis of total AGS ship system manning requirements. Amplification of the figures with regard to rank, rate, and rating may be found in the following sections.

A. Projected Manpower Requirements for AGS Embarked Survey Vehicles

This section outlines the estimated manpower requirements for various combinations of survey vehicles necessary to perform a given AGS emergency mission. In this context and for purposes of comparative configuration analysis, the AGS emergency mission becomes fourfold and is defined simply as "the rapid acquisition of Hydrographic, Geodetic and Photographic survey data along a coastal area of approximately 70 miles long by 15 miles wide, making possible the production of usable, multi-colored combat scale charts within either a 5, 10 or 15 day time frame." This oversimplification of the AGS emergency mission allows for the development of detailed manpower projections for the operation, maintenance, and personnel and logistics support of various combinations of survey vehicles that will perform effectively for extended at-sea periods given an adequate base of operation. At this point, it would be well to reiterate a specific limitation to this

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[1]The hydrofoils under consideration were assumed to be a scaled-down version of the Patrol Gunboat Hydrofoil (PGH) presently undergoing operational evaluation (OPEVAL) and has served as the model for determining the hydrofoil personnel requirements.

TABLE 2

Condensed Summary of Projected Manpower Requirements
for Hydrographic Survey Ship (AGS) System

System		5 Day Mission	10 Day Mission	15 Day Mission
Embarked Survey Vehicles				
I	Officer	12	7	7
	CPO	2	1	0
	Enlisted	347	158	106
	Total	361	166	113
II	Officer	10	7	6
	CPO	2	0	0
	Enlisted	190	88	65
	Total	202	95	71
III	Officer	11	8	8
	CPO	2	1	0
	Enlisted	276	132	90
	Total	289	141	98
IV	Officer	11	8	8
	CPO	2	1	0
	Enlisted	250	118	90
	Total	263	127	98
V	Officer	11	8	6
	CPO	2	1	1
	Enlisted	169	81	60
	Total	182	90	67
VI	Officer	12	6	6
	CPO	2	1	1
	Enlisted	199	101	91
	Total	213	108	98
VII	Officer	11	6	6
	CPO	2	1	1
	Enlisted	158	82	73
	Total	171	89	80
VIII	Officer	12	7	7
	CPO	2	1	1
	Enlisted	178	96	82
	Total	192	104	90
IX	Officer	13	7	7
	CPO	2	1	1
	Enlisted	181	96	82
	Total	196	104	90
X	Officer	83	38	24
	CPO	13	5	3
	Enlisted	268	124	86
	Total	364	167	113
XI	Officer	74	31	24
	CPO	11	3	3
	Enlisted	200	89	77
	Total	285	123	104
XII	Officer	81	35	25
	CPO	13	5	3
	Enlisted	245	118	91
	Total	339	158	119
XIII	Officer	75	32	25
	CPO	12	3	3
	Enlisted	235	109	91
	Total	322	144	119
Embarked Survey Team				
	Officer	11		
	CPO	1		
	Enlisted	31		
	Total	43		

AGS Ship Control

	Diesel Powered		Steam Powered	
	3600 hp (393')	16000 hp (517')	6000 hp (426')	22000 hp (564'-581')
Officer	15	17	16	18
CPO	8	8	9	9
Enlisted	116	159	140	192
Total	139	184	165	219

approach. Given total Navy AGS ship manning, it is believed that a reduction to the figures contained herein would result through a consolidation of certain ship and survey vehicle detachment personnel billet assignments. Although the magnitude of these reductions cannot be specified at this time, it appears that the alterations would primarily affect officer, repair department and administrative support personnel.

The manpower projections for the 39 survey vehicle configurations currently under consideration are outlined in Tables 3 through 15. As previously stated, these tables were developed using the data contained in Appendices A through D and represent a consolidation of vehicle personnel requirements within emergency mission time constraints. For this purpose, the survey vehicle crew requirements have been multiplied by a factor of three to allow for a three section crew rotation for 24-hour operations. It can be noted that these additional operating crew requirements have not altered the projected maintenance personnel requirements even though additional maintenance ratings (EN/ENFN/ADJ) have been provided. These additional personnel are provided primarily to meet vehicle operating requirements and will only supplement the maintenance force at a preventive maintenance rather than corrective maintenance level. It is believed that one complete three-section survey vehicle crew (9 to 12 personnel) can be subtracted from these individual totals to compensate for programmed vehicle down time.[2] This subtraction has not been performed for surface survey vehicles because actual planned maintenance schedules and projected vehicle down time are not currently known.

The assumption upon which the survey vehicle operation and maintenance personnel requirements contained herein are based include the following:

1. That vehicle and installed equipment operator vigilance tasks are such that on-board relief will not be required to complete an assigned mission (approximately four-hour duration).

2. That personnel, with the exception of helicopter crews, are assigned on a one crew per craft basis (for continuous 24-hour craft utilization, the boat operating crews must be multiplied by a factor of 3. In all cases, this will require nine operators per operating craft on a 4-on, 8-off watch basis).

3. That boat design and operation (Hydrofoil and Air Cushion Vehicle) will require no more than two operators (pilot and engineer).

4. That the installed survey, navigation and communications system (HYSURCH) will require no more than one equipment operator.

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[2]Helicopter down time has been included in the development of Appendix D and therefore is not included in this subtractive process.

5. That installed equipment will not require underway corrective maintenance.

6. That adequate stowage and machine shop facilities are available for survey vehicle maintenance support.

7. That personnel assigned to the ship control portion of the AGS ship system will be responsible for the operation and maintenance of the LCVP support boats.

8. That medical, messing and disbursing functions will be handled by other than survey vehicle detachment personnel.

It is also assumed that a survey mission of a given time duration will be similar for each distinct class of survey vehicles, i.e., each Hydrofoil, Air Cushion Vehicle or survey launch will be outfitted with similar equipment and function in the same operational capacity as their counterparts. For purposes of this study, a three-man crew and a four-hour mission time was used as the base for determining all manning configurations irrespective of craft size.[3] Although larger craft with increased on-station capabilities have been considered for AGS system use, missions in excess of four hours will require additional on-board relief operator personnel with little or no change in maintenance personnel requirements. The trade-off between the use of large boats versus small boats is not within the scope of this report.

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[3]It is believed that all survey craft considered herein can be safely and effectively operated by a crew of three for a period of four hours or less, with the possible exception of the ACV which may require one additional man for launch and recovery.

TABLE 3

Rank/Rate Summary of Projected Embarked
Survey Vehicle Manpower Requirements

SYSTEM NO. I

Rank/Rate	5 Day Mission		10 Day Mission		15 Day Mission	
	33 PBR Types	3 Sup. Helos	14 PBR Types	2 Sup. Helos	9 PBR Types	2 Sup. Helos
LCDR/LT/LTJG/ENS		9		6		6
LT	1					
ENS	1					
WO-1/2	1		1		1	
BM1	1		1		1	
BM2/3	99		42		27	
QM2/3	99		42		27	
PN3	2	1	1	1	1	1
SK3	1		1			
ENC	1		1			
EN1	1		1		1	
EN2	1					
EN3/ENFN	99		42		27	
MR1	1					
MR2	2		1			
MR3	2					
EM2	1		1		1	
EM3	2		2		1	
DC1	2		1		1	
DC2	1		1		1	
DC3	3		2			
FN	10		5		3	
ADJC		1				
ADJ1		1		1		1
ADJ2		1		1		1
ADJ3		2		1		1
ATN2		1				
ATN3		1		1		1
AMS1		1		1		1
AMH2		1		1		1
AMS3		1		1		1
PH1		1		1		1
PH2		2		1		1
AE2		1				
AE3		2		2		2
PR2		1		1		1
AZ3		1		1		1
AK3		1				
AN		1		1		1
Total	331	30	145	21	92	21

TABLE 4

Rank/Rate Summary of Projected Embarked
Survey Vehicle Manpower Requirements

SYSTEM NO. II

Rank/Rate	5 Day Mission		10 Day Mission		15 Day Mission	
	17 Planing Boats	3 Sup. Helos	7 Planing Boats	2 Sup. Helos	5 Planing Boats	2 Sup. Helos
LCDR/LT/ LTJG/ENS		9		6		6
WO-1/2	1		1			
BM1	1		1			
BM2/3	51		21		15	
QM2/3	51		21		15	
PN3	1	1	1	1	1	1
SK3	1					
ENC	1					
EN1	1		1		1	
EN3/ENFN	51		21		15	
MR2	1					
EM2	1		1		1	
EM3	2		1			
DC1	1		1		1	
DC2	1		1			
DC3	2					
FN	5		3		1	
ADJC		1				
ADJ1		1		1		1
ADJ2		1		1		1
ADJ3		2		1		1
ATN2		1				
ATN3		1		1		1
AMS1		1		1		1
AMH2		1		1		1
AMS3		1		1		1
PH1		1		1		1
PH2		2		1		1
AE2		1				
AE3		2		2		2
PR2		1		1		1
AZ3		1		1		1
AK3		1				
AN		1		1		1
Total	172	30	74	21	50	21

TABLE 5

Rank/Rate Summary of Projected Embarked
Survey Vehicle Manpower Requirements

SYSTEM NO. III

Rank/Rate	5 Day Mission		10 Day Mission		15 Day Mission	
	18 ACVs*	3 Sup. Helos	8 ACVs*.	2 Sup. Helos	5 ACVs*	2 Sup. Helos
LCDR/LT/LTJG/ENS		9		6		6
LTJG	1		1		1	
WO-1	1		1		1	
BM/QM1	54		24		15	
QM2/3	54		24		15	
ET1	6		3		2	
PN3	2	1	1	1	1	1
SK3	1		1		1	
SN	54		24		15	
ADJC	1	1	1			
ADJ1	2	1	1	1	1	1
ADJ2	3	1	2	1	1	1
ADJ3	54	2	24	1	15	1
ATN2		1				
ATN3		1		1		1
AMS1	1	1	1	1	1	1
AMS2	5		3		2	
AMH2		1		1		1
AMS3	5	1	2	1	1	1
AMSAN	9		4		3	
PH1		1		1		1
PH2		2		1		1
AE1	6		3		2	
AE2		1				
AE3		2		2		2
PR2		1		1		1
AZ3		1		1		1
AK3		1				
AN		1		1		1
Total	259	30	120	21	77	21

*Sidewall

TABLE 6

Rank/Rate Summary of Projected Embarked
Survey Vehicle Manpower Requirements

SYSTEM NO. IV

Rank/Rate	5 Day Mission		10 Day Mission		15 Day Mission	
	16 Skirted ACVs	3 Sup. Helos	7 Skirted ACVs	2 Sup. Helos	5 Skirted ACVs	2 Sup. Helos
LCDR/LT/ LTJG/ENS		9		6		6
LTJG	1		1		1	
WO-1	1		1		1	
BM/QM1	48		21		15	
QM2/3	48		21		15	
ET1	6		3		2	
PN3	2	1	1	1	1	1
SK3	1		1		1	
SN	48		21		15	
ADJC	1	1	1			
ADJ1	2	1	1	1	1	1
ADJ2	3	1	1	1	1	1
ADJ3	48	2	21	1	15	1
ATN2		1				
ATN3		1		1		1
AMS1	1	1	1	1	1	1
AMS2	5		3		2	
AMH2		1		1		1
AMS3	4	1	1	1	1	1
AMSAN	8		4		3	
PH1		1		1		1
PH2		2		1		1
AE1	6		3		2	
AE2		1				
AE3		2		2		2
PR2		1		1		1
AZ3		1		1		1
AK3		1				
AN		1		1		1
Total	233	30	106	21	77	21

TABLE 7

Rank/Rate Summary of Projected Embarked
Survey Vehicle Manpower Requirements

SYSTEM NO. V

Rank/Rate	5 Day Mission		10 Day Mission		15 Day Mission	
	14 Hydro.	3 Sup. Helos	6 Hydro.	2 Sup. Helos	4 Hydro.	2 Sup. Helos
LCDR/LT/LTJG/ENS		9		6		6
LTJG	1		1			
ENS	1		1			
BM/QM1	42		18		12	
QM2/3	42		18		12	
ET1	1		1		1	
ETN2	6		2		1	
PN3	1	1	1	1	1	1
SK3	1		1		1	
SN/SA	4		2		1	
ENC	1		1		1	
EN2/3	42		18		12	
SFM2	1		1		1	
SFM3	1					
EM1	1		1		1	
EM2	1		1			
EM3	1					
FN	5		2		2	
ADJC		1				
ADJ1		1		1		1
ADJ2		1		1		1
ADJ3		2		1		1
ATN2		1				
ATN3		1		1		1
AMS1		1		1		1
AMH2		1		1		1
AMS3		1		1		1
PH1		1		1		1
PH2		2		1		1
AE2		1				
AE3		2		2		2
PR2		1		1		1
AZ3		1		1		1
AK3		1				
AN		1		1		1
Total	152	30	69	21	46	21

TABLE 8

Rank/Rate Summary of Projected Embarked
Survey Vehicle Manpower Requirements

SYSTEM NO. VI

	5 Day Mission			10 Day Mission			15 Day Mission		
Rank/Rate	8 PBR Types	9 Hydro.	3 Sup. Helos	4 PBR Types	4 Hydro.	2 Sup. Helos	4 PBR Types	3 Hydro.	2 Sup. Helos
LCDR/LT/ LTJG/ENS			9			6			6
LTJG		1							
ENS		1							
WO-1/2	1								
BM1	1								
BM/QM1		27			12			9	
BM2/3	24			12			12		
QM2/3	24	27		12	12		12	9	
ET1		1			1			1	
ETN2		4			1			1	
PN3	1	1	1	1	1	1	1	1	1
SK3		1			1			1	
SN/SA		3			1			1	
ENC		1			1			1	
EN1	1			1			1		
EN2/3		27			12			9	
EN3/ENFN	24			12			12		
SFM2		1			1			1	
EM1		1			1			1	
EM2	1	1		1			1		
EM3	1								
DC1	1			1			1		
DC2	1								
FN	3	3		1	2		1	1	
ADJC			1						
ADJ1			1			1			1
ADJ2			1			1			1
ADJ3			2			1			1
ATN2			1						
ATN3			1			1			1
AMS1			1			1			1
AMH2			1			1			1
AMS3			1			1			1
PH1			1			1			1
PH2			2			1			1
AE2			1						
AE3			2			2			2
PR2			1			1			1
AZ3			1			1			1
AK3			1						
AN			1			1			1
Total	83	100	30	41	46	21	41	36	21

TABLE 9

Rank/Rate Summary of Projected Embarked
Survey Vehicle Manpower Requirements

SYSTEM NO. VII

Rank/Rate	5 Day Mission			10 Day Mission			15 Day Mission		
	4 Planing Bts.	9 Hydro.	3 Sup. Helos	3 Planing Bts.	3 Hydro.	2 Sup. Helos	2 Planing Bts.	3 Hydro.	2 Sup. Helos
LCDR/LT/ LTJG/ENS			9			6			6
LTJG		1							
ENS		1							
BM/QM1		27			9			9	
BM2/3	12			9			6		
QM2/3	12	27		9	9		6	9	
ET1		1			1			1	
ETN2		4			1			1	
PN3	1	1	1	1	1	1	1	1	1
SK3		1			1			1	
SN/SA		3			1			1	
ENC		1			1			1	
EN1	1			1			1		
EN2/3		27			9			9	
EN3/ENFN	12			9			6		
SFM2		1			1			1	
EM1		1			1			1	
EM2	1	1		1			1		
DC1	1			1			1		
FN	1	3		1	1		1	1	
ADJC			1						
ADJ1			1			1			1
ADJ2			1			1			1
ADJ3			2			1			1
ATN2			1						
ATN3			1			1			1
AMS1			1			1			1
AMH2			1			1			1
AMS3			1			1			1
PH1			1			1			1
PH2			2			1			1
AE2			1						
AE3			2			2			2
PR2			1			1			1
AZ3			1			1			1
AK3			1						
AN			1			1			1
Total	41	100	30	32	36	21	23	36	21

TABLE 10

Rank/Rate Summary of Projected Embarked
Survey Vehicle Manpower Requirements

SYSTEM NO. VIII

Rank/Rate	5 Day Mission			10 Day Mission			15 Day Mission		
	4 ACVs*	9 Hydro.	3 Sup. Helos	3 ACVs*	3 Hyrdo.	2 Sup. Helos	2 ACVs*	3 Hydro.	2 Sup. Helos
LCDR/LT/ LTJG/ENS			9			6			6
LTJG		1							
ENS		1							
WO-1	1			1			1		
BM/QM1	12	27		9	9		6	9	
QM2/3	12	27		9	9		6	9	
ET1	2	1		1	1		1	1	
ETN2		4			1			1	
PN3	1	1	1	1	1	1	1	1	1
SK3	1	1		1	1			1	
SN/SA	12	3		9	1		6	1	
ENC		1			1			1	
EN2/3		27			9			9	
SFM2		1			1			1	
EM1		1			1			1	
EM2		1							
FN		3			1			1	
ADJC			1						
ADJ1	1		1	1		1	1		1
ADJ2	1		1	1		1	1		1
ADJ3	12		2	9		1	6		1
ATN2			1						
ATN3			1			1			1
AMS1			1			1			1
AMS2	2			2			2		
AMH2			1			1			1
AMS3	1		1			1			1
AMSAN	2			2			1		
PH1			1			1			1
PH2			2			1			1
AE1	2			1			1		
AE2			1						
AE3			2			2			2
PR2			1			1			1
AZ3			1			1			1
AK3			1						
AN			1			1			1
Total	62	100	30	47	36	21	33	36	21

*Sidewall

TABLE 11

Rank/Rate Summary of Projected Embarked
Survey Vehicle Manpower Requirements

SYSTEM NO. IX

Rank/Rate	5 Day Mission			10 Day Mission			15 Day Mission		
	5 Skirted ACVs	8 Hydro.	3 Sup. Helos	3 Skirted ACVs	3 Hydro.	2 Sup. Helos	2 Skirted ACVs	3 Hydro.	2 Sup. Helos
LCDR/LT/ LTJG/ENS			9			6			6
LTJG	1	1							
ENS		1							
WO-1	1			1			1		
BM/QM1	15	24		9	9		6	9	
QM2/3	15	24		9	9		6	9	
ET1	2	1		1	1		1	1	
ETN2		3			1			1	
PN3	1	1	1	1	1	1	1	1	1
SK3	1	1		1	1			1	
SN/SA	15	2		9	1		6	1	
ENC		1			1			1	
EN2/3		24			9			9	
SFM2		1			1			1	
EM1		1			1			1	
EM2		1							
FN		3			1			1	
ADJC			1						
ADJ1	1		1	1		1	1		1
ADJ2	1		1	1		1	1		1
ADJ3	15		2	9		1	6		1
ATN2			1						
ATN3			1			1			1
AMS1	1		1			1			1
AMS2	2			2			2		
AMH2			1			1			1
AMS3	1		1			1			1
AMSAN	3			2			1		
PH1			1			1			1
PH2			2			1			1
AE1	2			1			1		
AE2			1						
AE3			2			2			2
PR2			1			1			1
AZ3			1			1			1
AK3			1						
AN			1			1			1
Total	77	89	30	47	36	21	33	36	21

TABLE 12

Rank/Rate Summary of Projected Embarked
Survey Vehicle Manpower Requirements

SYSTEM NO. X

Rank/Rate	5 Day Mission		10 Day Mission		15 Day Mission	
	13 PBR Types	23 Helos*	6 PBR Types	9 Helos*	4 PBR Types	6 Helos*
CDR/LCDR/LT/LTJG/ENS		81		36		24
WO-1/2	1	1	1	1		
BM1	1		1			
BM2/3	39		18		12	
QM2/3	39		18		12	
YN1		1		1		
YN3		1				
PN2		1				
PN3	1	1	1	1	1	1
SK3	1					
ENC	1					
EN1	1		1		1	
EN3/ENFN	39		18		12	
MR2	1					
EM2	1		1		1	
EM3	2		1			
DC1	1		1		1	
DC2	1		1			
DC3	2					
FN	5		3		1	
AFCM		1		1		
ADCS		2		1		1
ADJC		2		1		1
ADJ1		5		3		2
ADJ2		9		4		3
ADJ3		13		4		3
ADJAN		7		3		2
AVCM		1				
ATCS		1				
ATC		1		1		
AT1		2		1		1
ATN2		5		3		2
ATN3		8		3		3
ATNAN		5		2		1
AMCS		2		1		1
AMSC		1				
AMS1		2		1		1
AMH1		1		1		
AMS2		4		2		1
AMH2		4		2		2
AMS3		5		2		2
AMH3		2		1		1
AMSAN		3		1		
AMHAN		2				
AEC		1				
AE1		2		1		1
AE2		6		2		2
AE3		8		4		3
AEAN		5		2		1
PH1		1		1		1
PH2		3		3		3
PR1		1		1		
PR2		2		1		1
PR3		2		1		1
PRAN		2				
AZ1		1		1		
AZ2		2		1		1
AZ3		2		1		1
AZAN		1				
AK1		1				
AK3		1		1		1
AN		13		5		4
Total	136	228	65	102	41	72

*Support Helo manning requirements included within listed figures.

TABLE 13

Rank/Rate Summary of Projected Embarked
Survey Vehicle Manpower Requirements

SYSTEM NO. XI

Rank/Rate	5 Day Mission		10 Day Mission		15 Day Mission	
	8 Planing Bts.	20 Helos*	4 Planing Bts.	7 Helos*	3 Planing Bts.	6 Helos*
CDR/LCDR/LT/LTJG						
ENS		72		30		24
WO-1/2	1	1		1		
BM1	1					
BM2/3	24		12		9	
QM2/3	24		12		9	
YN1		1				
YN3		1				
PN2		1				
PN3	1	1	1	1	1	1
EN1	1		1		1	
EN3/ENFN	24		12		9	
EM2	1		1		1	
EM3	1					
DC1	1		1		1	
DC2	1					
FN	3		1		1	
AFCM		1				
ADCS		2		1		1
ADJC		2		1		1
ADJ1		4		2		2
ADJ2		8		3		3
ADJ3		11		4		3
ADJAN		6		2		2
AVCM		1				
ATCS		1				
ATC		1				
AT1		1		1		1
ATN2		5		2		2
ATN3		7		3		3
ATNAN		4		1		1
AMCS		1		1		1
AMSC		1				
AMS1		2		1		1
AMH1		1				
AMS2		4		1		1
AMH2		3		2		2
AMS3		4		2		2
AMH3		2		1		1
AMSAN		2		1		
AMHAN		2				
AEC		1				
AE1		2		1		1
AE2		5		2		2
AE3		7		4		3
AEAN		5		1		1
PH1		1		1		1
PH2		3		3		3
PR1		1				
PR2		1		1		1
PR3		2		1		1
PRAN		2				
AZ1		1				
AZ2		2		1		1
AZ3		2		1		1
AZAN		1				
AK1		1				
AK3		1		1		1
AN		11		4		4
Total	83	202	41	82	32	72

*Support Helo manning requirements included within listed figures.

TABLE 14

Rank/Rate Summary of Projected Embarked
Survey Vehicle Manpower Requirements

SYSTEM NO. XII

	5 Day Mission		10 Day Mission		15 Day Mission	
	8	22	4	8	3	6
Rank/Rat	ACVs#	Helos*	ACVs*	Helos*	ACVs#	Helos*
CDR/LCDR/LT/LTJG/ENS		78		33		24
LTJG	1					
WO-1	1	1	1	1	1	
BM/QM1	24		12		9	
QM2/3	24		12		9	
ET1	3		2		1	
YN1		1		1		
YN3		1				
PN2		1				
PN3	1	1	1	1	1	1
SK3	1		1		1	
SN	24		12		9	
AFCM		1		1		
ADCS		2		1		1
ADJC	1	2		1		1
ADJ1	1	5	1	2	1	2
ADJ2	2	8	1	4	1	3
ADJ3	24	12	12	4	9	3
ADJAN		7		3		2
AVCM		1				
ATCS		1				
ATC		1		1		
AT1		2		1		1
ATN2		5		2		2
ATN3		8		3		3
ATNAN		4		2		1
AMCS		2		1		1
AMSC		1				
AMS1	1	2		1		1
AMH1		1		1		
AMS2	3	4	2	2	2	1
AMH2		4		2		2
AMS3	2	4	1	2		2
AMH3		2		1		1
AMSAN	4	3	2	1	2	
AMHAN		2				
AEC		1				
AE1	3	2	2	1	1	1
AE2		6		2		2
AE3		7		4		3
AEAN		5		2		1
PH1		1		1		1
PH2		3		3		3
PR1		1		1		
PR2		2		1		1
PR3		2		1		1
PRAN		2				
AZ1		1				
AZ2		2		1		1
AZ3		2		1		1
AZAN		1				
AK1		1				
AK3		1		1		1
AN		12		5		4
Total	120	219	62	96	47	72

#Sidewall
*Support Helo manning requirements included within listed figures.

TABLE 15

Rank/Rate Summary of Projected Embarked
Survey Vehicle Manpower Requirements

SYSTEM NO. XIII

Rank/Rate	5 Day Mission		10 Day Mission		15 Day Mission	
	8 Skirted ACVs	20 Helos*	4 Skirted ACVs	7 Helos*	3 Skirted ACVs	6 Helos*
CDR/LCDR/LT/LTJG/ENS		72		30		24
LTJG	1					
WO-1	1	1	1	1	1	
BM/QM1	24		12		9	
QM2/3	24		12		9	
ET1	3		2		1	
YN1		1				
YN3		1				
PN2		1				
PN3	1	1	1	1	1	1
SK3	1		1		1	
SN	24		12		9	
AFCM		1				
ADCS		2		1		1
ADJC	1	2		1		1
ADJ1	1	4	1	2	1	2
ADJ2	2	8	1	3	1	3
ADJ3	24	11	12	4	9	3
ADJAN		6		2		2
AVCM		1				
ATCS		1				
ATC		1				
AT1		1		1		1
ATN2		5		2		2
ATN3		7		3		3
ATNAN		4		1		1
AMCS		1		1		1
AMSC		1				
AMS1	1	2		1		1
AMH1		1				
AMS2	3	4	2	1	2	1
AMH2		3		2		2
AMS3	2	4	1	2		2
AMH3		2		1		1
AMSAN	4	2	2	1	2	
AMHAN		2				
AEC		1				
AE1	3	2	2	1	1	1
AE2		5		2		2
AE3		7		4		3
AEAN		5		1		1
PH1		1		1		1
PH2		3		3		3
PR1		1				
PR2		1		1		1
PR3		2		1		1
PRAN		2				
AZ1		1				
AZ2		2		1		1
AZ3		2		1		1
AZAN		1				
AK1		1				
AK3		1		1		1
AN		11		4		4
Total	120	202	62	82	47	72

*Support Helo manning requirements included within listed figures.

B. Projected Manpower Requirements for AGS Embarked Survey Team

The personnel planning data contained in this section are estimates of the quantitative Navy personnel requirements for the AGS embarked Hydrographic Survey Team. The survey team as defined for purposes of this report consists of those personnel who perform the overall survey planning, data collection, compilation, interpretation, refining, and production functions which result in development of hydrographic survey charts. These initial estimates are based upon limited investigation of available Hydrographic Survey and Charting System (HYSURCH) documentation (1, 2, 8) and personal interviews with cognizant system personnel to establish effective guidelines from which an extrapolation of total Navy personnel requirements could be made. Currently, a greater percentage of HYSURCH related tasks are being performed by U. S. Naval Oceanographic Office civilian personnel and it appears that few Navy officer and enlisted occupational codes correspond directly to these positions. In developing this section, best estimates of Navy ranks, rates, NOBCs, and NECs were used in an attempt to quantify and point out the qualitative implications of a Navy manned survey team.

The HYSURCH System is composed of four subsystems which are further broken down into related component groups. These include the following:

(1) Data Handling Subsystem

  (a) Hydrographic Data Collection Group (Appendix E, Part 1)

  (b) Hydrographic Chart Compilation Group (Appendix E, Part 2)

  (c) Graphics Processing and Reproduction Group (Appendix E, Part 3)

(2) Position Subsystem

  (a) Master Platform

  (b) Remote Buoys (2)

(3) Aerial Survey Subsystem

(4) Surface Survey Subsystem

With the exception of specific HYSURCH electronic and computer maintenance personnel, the projected manpower requirements for the Aerial and Surface Subsystems have been established in Section A. This section is concerned wholly with the development of projected manpower requirements for the remaining two subsystems to include the personnel requirements for survey vehicle HYSURCH electronic and computer equipment maintenance. Appendix E, Parts 1 through 3, contain the estimated quantitative and qualitative manpower projections for the Data Handling Subsystem based on a 24 hour operations requirement. The Positioning Subsystem which serves as the baseline for survey operations will require operational and maintenance

support; however, it is believed that the personnel assigned to the Data Handling Subsystem will be capable of performing the necessary support functions. The assigned Hydrographic/Cartographic Officers or Hydrographic Survey Officer and Engineering Aid (EA) personnel should be qualified to locate and initiate Positioning Subsystem equipment with the help of support vehicle crews. Assuming that the Remote Station Buoys can, and will, operate as unmanned self-contained units when located at sea, they should also be capable of operating in an identical fashion when positioned on land. Therefore, it is believed that a standard Navy beach unit will not be required. If daily station checks are considered impractical and it becomes necessary to provide a security detachment with each land located remote station, one survey team EA and one boat crew member assigned on a daily basis should be adequate.

Part 4 of Appendix E presents a listing of the projected Hydrographic Survey Team Administrative support personnel requirements. These requirements are only valid providing MSTS personnel are assigned for AGS ship control. If total ship Navy manning is used, these requirements will be met by ship's company personnel. Table 16 is a condensed summary of the projected rank/rates required for the AGS embarked survey team contained in Appendix E.

C. Projected AGS Ship Control Manpower Requirements

This section is intended to provide an outline of the estimated quantitative Navy manpower requirements for the ship control portion of the total AGS ship system and includes personnel projections for the four representative AGS ship candidates previously described. Within this framework, additional ship design requirements have been specified which call for the automation of certain bridge and engineering functions that can be expected to reduce the total number of watchstander personnel normally assigned to these stations. In accomplishing the personnel planning tasks for these four representative ship candidates, the Manpower Authorization documents (OPNAV Form 1000/2) for five candidate-related, Navy ship types were obtained. These included the AFS-5, LKA-116, LST-1182, AGS-16 and the T-AGS-29. Selection of these ship types was principally on the basis of relative size, type propulsion plant and the degree of automation with respect to these four candidate proposals. The AFS and LKA were used as representatives for the large steam candidate because of the comparable size, propulsion plant, and automated engineering features. The LKA was also used as a reference for boat handling equipment personnel requirements. The AGS-16 was used to represent the small steam candidate while the LST and T-AGS were used to represent the large and small diesel candidates respectively. The LST was used only for engineering department personnel estimates because of the size and automated features of the engineering plant. Officer personnel estimates are based on the officer allowances for all ships previously mentioned with particular emphasis given to the AGS-16 due to the similarity in mission requirements.

For planning purposes, it is believed that the four ship types outlined in this section present an acceptable measure of the projected quantitative personnel requirements for all possible ship candidates within the parameters

TABLE 16

Rank/Rate Summary of Projected Manpower Requirements
for AGS Embarked Survey Team*

Rank/Rate	No.	Rank/Rate	No.
LCDR	1	DK2	1
LT	4	DK Total	1
LTJG	5		
ENS	1	LI1	1
Off. Total	11	LI2	1
		LI Total	2
ET1	1		
ETN2	2	DM2	1
ET Total	3	DM Total	1
DS1	2	EAC	1
DS2	3	EA1	2
DS3	2	EA2	3
DS Total	7	EA3	2
		EA Total	8
RM1	1		
RM2	1	PT1	1
RM3	1	PT Total	1
RM Total	3		
		PH1	1
YN1	1	PH2	1
CYN3	1	PH Total	2
YN/CYN Total	2		
		HM1	1
SK2	1	HM Total	1
SK Total	1		
		Total = 43	

*Based on 24 hour operations.

of the AGS CFP. General modification to these basic ship dimensions and propulsion systems would tend to alter the qualitative, rather than quantitative, personnel estimates contained herein. Therefore, due to time limitations and also to maintain a degree of simplicity in presenting these preliminary personnel research data, certain variations in ship design have been omitted. Future personnel research will include applicable manpower data for specific selected ship design characteristics.

Unlike the two preceding AGS subdivisions, the personnel requirements for the ship control portion are not wholly dependent upon emergency mission time constraints. The manpower projections for this subdivision are estimates of the personnel required to operate, maintain, and support a

specific ship type designed to conduct hydrographic survey operations. With the possible exception of the personnel involved with boat handling operations, the shipboard personnel requirements are not affected by emergency mission time constraints and will remain the same for both normal and emergency missions.

The procedures used in the development of this section have necessitated the use of certain assumptions regarding projected system quantities. These assumptions are basically a result of the limitations previously mentioned with respect to the integration of billet assignments and are listed below:

1. That for administrative support personnel planning, total AGS manning (vehicles, survey team and ship's company) will range from an approximate minimum of 255 to an approximate maximum of 625 officer and enlisted personnel.

2. That listed ship's deck department and engineering department (repair) personnel will be supplemented by embarked survey vehicle personnel when not engaged in survey operations. This assumption is reflected in the minimum numbers of nonrated personnel listed in the projected ship's company breakdown (Table 17).

3. That ship's ordnance will consist of small arms only, thereby eliminating the need for a large weapons personnel organization.

4. That the final AGS automated engineering plant will be similar to those used as references in the development of this report.

Appendix F lists the total manpower requirements for a Hydrographic Survey Ship (AGS) based on the representative ship candidate configurations. This appendix describes the billet assignments within each major shipboard department. Table 17 presents a condensed summary of the figures.

TABLE 17

Rank/Rate Summary of Projected Manpower Requirements for Hydrographic Survey Ship (AGS)

Rank/ Rate	Diesel Powered 3600 hp (393')	Diesel Powered 16000 hp (517')	Steam Powered 6000 hp (426')	Steam Powered 22000 hp (564'-581')
CAPT	1	1	1	1
CDR	1	1	1	1
LCDR	-	1	-	1
LT	6	5	6	5
LTJG	1	3	1	3
ENS	5	4	5	4
CWO-2	1	2	2	3
Off. Total	15	17	16	18
BMC	1	1	1	1
BM1	2	2	2	2
BM2	1	1	1	1
BM3	2	2	2	2
BM Total	6	6	6	6
QMC	1	1	1	1
QM2	1	1	1	1
QM3	1	1	1	1
QM Tr. (SN/SA)	-	1	-	1
QM Total	3	4	3	4
SM2	1	1	1	1
SM3	2	2	2	2
SMSN	-	1	-	1
SM Total	3	4	3	4

Rank/ Rate	Diesel Powered 3600 hp (393')	Diesel Powered 16000 hp (517')	Steam Powered 6000 hp (426')	Steam Powered 22000 hp (564'-581')
RD1	1	1	1	1
RD2	1	1	1	1
RD3	1	2	1	2
RDSN	1	2	1	2
RD Tr. (SN/SA)	-	1	-	1
RD Total	4	7	4	7
GMG2	1	1	1	1
GMGSN	-	1	-	1
GMG Total	1	2	1	2
ETC	1	1	1	1
ETN2	1	1	1	1
ETR2	1	1	1	1
ETN3	2	2	2	2
ETR3	1	1	1	1
ETNSN	-	1	-	1
ET Total	6	7	6	7
RMC	1	1	1	1
RM2	3	3	3	3
RM3	2	4	2	4
RMSN	3	3	3	3
RM Total	9	11	9	11
YN2	1	1	1	1
YN3	1	1	1	1
YNSN	-	1	-	1
CYN3/CYNSN	3	3	3	3
YN Total	5	6	5	6

(Table continued on next page)

TABLE 17 (Continued)

Rank/ Rate	Diesel Powered		Steam Powered	
	3600 hp (393')	16000 hp (517')	6000 hp (426')	22000 hp (564'-581')
PN1	-	1	-	1
PN2	1	-	1	-
PNSN	-	1	-	1
PN Total	1	2	1	2
SKC	1	1	1	1
SK1	1	1	1	1
SK3	1	2	1	2
SKSN	1	2	1	2
SK Total	4	6	4	6
DK3	-	1	-	1
DKSN	1	-	1	-
DK Total	1	1	1	1
CSC	1	1	1	1
CS1	1	1	1	1
CS2	2	2	2	2
CS3	1	2	1	2
CS Tr. (SN/SA)	2	3	2	3
CS Total	7	9	7	9
SH1	1	1	1	1
SH2	1	1	1	1
SH3	2	2	2	2
SH Tr. (SN/SA)	1	2	1	2
SH Total	5	6	5	6

Rank/ Rate	Diesel Powered		Steam Powered	
	3600 hp (393')	16000 hp (517')	6000 hp (426')	22000 hp (564'-581')
PC2	1	1	1	1
PCSN	-	1	-	1
PC Total	1	2	1	2
SN	11	16	11	16
SA	5	10	5	10
Total	16	26	16	26
MMCS	-	-	1	1
MM1	-	-	3	3
MM2	-	-	4	4
MM3	-	-	4	4
MMFN	-	-	1	1
MM Tr. (FN/FA)	-	-	9	9
MM Total	-	-	22	22
ENC	1	1	-	-
EN1	2	3	1	1
EN2	2	3	2	2
EN3	4	5	3	3
ENFN	3	4	-	-
EN Tr. (FN/FA)	4	5	2	4
EN Total	16	21	8	10
MR2	1	1	1	1
MR Total	1	1	1	1

(Table continued on next page)

TABLE 17 (Continued)

Rank/ Rate	Diesel Powered 3600 hp (393')	Diesel Powered 16000 hp (517')	Steam Powered 6000 hp (426')	Steam Powered 22000 hp (564'-581')
BTC	-	-	1	1
BT1	-	-	1	2
BT2	-	1	2	8
BT3	1	-	4	5
BTFN	-	-	-	1
BT Tr. (FN/FA)	-	-	3	4
BT Total	1	1	11	21
BR1	-	-	-	1
BR Total	-	-	-	1
EMC	1	1	1	1
EM1	1	2	1	2
EM2	1	3	1	3
EM3	2	3	2	3
EMFN	2	2	2	2
EM Tr. (FN/FA)	-	2	-	2
EM Total	7	13	7	13
IC1	1	1	1	1
IC2	1	2	1	2
IC3	-	1	-	1
ICFN	1	1	1	1
IC Total	3	5	3	5

Rank/ Rate	Diesel Powered 3600 hp (393')	Diesel Powered 16000 hp (517')	Steam Powered 6000 hp (426')	Steam Powered 22000 hp (564'-581')
SF1	1	1	1	1
SFM3	-	-	-	1
SFP3	1	1	1	1
SF Tr. (FN/FA)	1	2	1	2
SF Total	3	4	3	5
DC1	1	1	1	1
DC3	1	1	2	2
DCFN	-	1	-	1
DC Total	2	3	3	4
AG2	1	1	1	1
AG3	1	1	1	1
AG Total	2	2	2	2
HM3	1	1	1	1
HN	-	1	-	1
HM Total	1	2	1	2
DT2	1	1	1	1
DT Total	1	1	1	1
SD1	1	1	1	1
SD2	1	1	1	1
SD3	3	3	3	3
TN/TA	10	10	10	10
SD Total	15	15	15	15
Off.	15	17	16	18
CPO	8	8	9	9
Enl.	116	159	140	192
Grand Total	139	184	165	219

III. AGS PERSONNEL TRAINING IMPLICATIONS

The estimated training required to qualify AGS assigned personnel currently appears to be well within the present capabilities of existing Navy training programs with the possible exception of curricula relating to (1) the HYSURCH system, and (2) hydrofoil and air-cushion vehicle equipment operation and maintenance personnel qualification. These two notable exceptions refer to equipments that are currently in the Concept Formulation Phase of system development or are presently undergoing operational test and evaluation. Although these equipments are basically related to existing Navy and hydrographic survey equipment, they appear to be significantly different in concept or design to require the establishment of specialized training courses. The use of a computer complex in HYSURCH will change the current personnel allowance for AGS ships to include digitally trained maintenance technicians and also alter equipment operator requirements to reflect skills associated with the operation and control of computer peripheral equipment. The proposed use of hydrofoil and air-cushion vehicles for survey operations will also add to the training requirements for operational and maintenance team personnel in order to meet the increased demands of these advanced high-speed survey craft.

1. The HYSURCH System

Preliminary HYSURCH personnel research has been initiated to provide estimated quantitative personnel information relating to AGS shipboard and survey vehicle requirements. These quantitative personnel estimates have been based upon: (a) existing hydrographic survey equipment; (b) state-of-the-art advancements in computer technology, depth determining, printing and reproduction equipment; and (c) existing hydrographic survey ship billet requirements including ranks, rates, NOBCs and NECs where they appear adaptable to the new system. The qualitative personnel projections reflected in these estimates reveal that the qualifications and requirements relating to a Hydrographic/Cartographic Officer represent the only billet category that does not currently appear in the Navy manpower inventory with the possible exception of hydrographic survey equipment operators (see Note 4, page 35).

Detailed training requirements for overall operation and maintenance of HYSURCH equipment cannot be specified at this time due to the early stage of system development and lack of qualitative system data necessary to perform the required functional and operational analyses for the determination thereof. Future NPTRL personnel research will be designed to establish a working base from which specific personnel tasks can be outlined and personnel performance and training effectiveness information derived.

2. Survey Vehicles

AGS emergency mission guidelines regarding mission duration have made it necessary to investigate the feasibility of using high-speed surface craft for hydrographic data gathering operations. Currently, in addition to the more conventional planing and sounding boats, two distinctly different high-speed surface survey vehicles are under consideration for use in the data

gathering operation. These include 10-ton hydrofoil craft and either (a) skirted, Patrol Air-Cushion Vehicles, SK-5 (PACVs) or (b) sidewall, Survey-marine, Air-Cushion Vehicles, HM-2 (ACVs). The vehicle combination to be used in the final system has not been determined, but under certain system proposals, either or both hydrofoils and ACVs may be used. The operations and maintenance requirements for these types of vehicles will be of a considerably more specialized nature than currently exists for hydrographic survey vehicles and will create a need for vehicle oriented training programs to qualify personnel of task related Navy rates and ratings.

Since the Patrol Gunboat Hydrofoil (PGH) and PACV Research and Development programs have not completed test and evaluation to date, it is not known whether either of these programs, as they presently exist, will be continued in the overall ship-building program. Hydrofoil and ACV operations and maintenance training presently consists primarily of factory training with limited in-service training ostensibly of an on-the-job nature. Final acceptance and Navy employment of hydrofoil or ACV craft would insure the establishment of specific craft oriented training programs that could serve to qualify AGS survey vehicle assigned personnel and also establish a pool from which qualified hydrofoil and ACV operator and maintenance personnel could possibly be drawn. It is believed that establishment of such programs would preclude the necessity for the development of specific AGS survey vehicle training programs.

IV. CONCLUSIONS

1. AGS emergency mission requirements are such that continuous survey operations will be necessary to complete the data gathering task. From an operational standpoint, the numbers of survey vehicles required to perform this task are inversely proportional to emergency mission time constraints. For personnel planning purposes, this means that the shorter mission times will cost more in terms of quantitative and, to a lesser degree, qualitative manpower requirements than will the longer missions. The three section crew rotation provided for in this report is considered mandatory for continuous 24-hour operations to ensure maximum system effectiveness and also eliminate the danger of crew fatigue in a high-speed surface craft environment.

2. The provisions for sufficient numbers of qualified personnel to effectively perform under emergency mission time constraints have been established as a major consideration in the development of AGS system manpower projections. For normal AGS operations, when time is of less importance, this consideration has a proportional negative effect on overall AGS manpower utilization effectiveness. Eight to twelve hour survey operations would idle off-crew personnel for a greater portion of the workday.

3. A review of current Navy occupational codes has revealed that a Hydrographic/Cartographic Officer is not presently in the Navy manpower inventory and only limited numbers of Hydrographic Survey Control Officers, NOBC-2330, are available for AGS employment. Although there appears to be ample enlisted rates which are adaptable to the AGS/HYSURCH systems, it is believed that additional special training and the establishment of new NECs will be required to provide for a qualified Navy Hydrographic Survey Team. These would include selected Data Systems Technician (DS), Electronics Technician (ET), and survey equipment operator personnel[4] in addition to the Hydrographic/Cartographic Officer previously mentioned.

4. The FY 1970 personnel research effort must concentrate on the review and refinement of the quantitative Navy manpower requirements for the AGS Ship System so that effective personnel utilization guidelines can be established. In addition, this effort must be attentive to the development of qualitative personnel requirements to ensure that optimum integration and consolidation of these requirements are achieved.

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[4] Quartermasters with an NEC of 9594 were initially selected for this function within the survey vehicle detachment. This NEC has recently been discontinued (9).

APPENDIX A

PROJECTED HYDROFOIL (TYPE F) MANNING
REQUIREMENTS (1-15 boats)

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APPENDIX A

PROJECTED HYDROFOIL (TYPE F) MANNING REQUIREMENTS (1-15 boats)

Location	Billet Title	Rank/ Rate	HYDROFOIL 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Maximum No. Req.
Operating Craft (Crew)	POinC; Pilot	BM/QM1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	15
	*Gas-Turbine Eng. NEC EN-4354	EN2/3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	15
	Equip.Oper.	QM2/3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	15
		**Total	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	45
Ship Based Maintenance Team	Officer in Charge	LTJG					1											1
	Maint.Off./Div.Off.	ENS					1											1
	Gas-Turbine Tech. EN-4354	ENC	1															1
	Elect.Tech./Auto.	ET1	1															1
	Control Sys. Tech.	ETN2			1		1		1		1		1			1		6
	Shipfitter	SFM2	1															1
	"	SFM3										1						1
	Electrical Spec.	EM1	1															1
	" "	EM2						1										1
	" "	EM3												1				1
	Eng./Shipfitter/ Elec. Asst.	FN		1		1			1				1			1		5
	Boat Maintainer, Gen.	SN/SA	1					1			1				1			4
	Repair Parts Man	SK3			1													1
	Personnelman	PN3	1															1
		Total	6	1	2	1	3	2	2	0	2	1	2	1	1	2	0	26
	Cumulative	Total	6	7	9	10	13	15	17	17	19	20	22	23	24	26	26	26
																	Maximum Grand Total	71

Identification of NECs

EN-4354 Gas-Turbine Engine Tech. (must also be qualified in hydraulic systems for retractable foil systems).

* Also member of Maintenance Team.

** For continuous 24 hr. boat utilization, totals for operator personnel must be multiplied by a factor of 3.

APPENDIX B

PROJECTED AIR CUSHION VEHICLE (TYPES C AND D)
MANNING REQUIREMENTS (1-20 boats)

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APPENDIX B

PROJECTED AIR CUSHION VEHICLE (TYPES C AND D)
MANNING REQUIREMENTS (1-20 boats)

Location	Billet Title	Rank/ Rate	AIR CUSHION VEHICLE																				Maximum No. Req.
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
Operating Craft (Crew)	POinC; Pilot	BM/QM1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	20
	*Jet-Turbine Engineer	ADJ3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	20
	Equip.Oper.	QM2/3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	20
	Seaman	SN	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	20
	**Total		4	8	12	16	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	80
Ship Based Maintenance Team	Officer in Charge	LTJG					1																1
	Maint.Off./Div.Off.	@WO-1	1																				1
	Jet-Turbine Tech.	ADJC							1														1
	" " "	ADJ1	1													1							2
	" " "	ADJ2		1						1							1						3
	Electronics Tech.	ET1	1			1			1			1			1			1			1		7
	Electrical Spec.	AE1	1			1			1			1			1			1			1		7
	Structural Spec.	AMS1					1															1	2
	" "	AMS2	1	1				1				1						1					5
	" "	AMS3				1				1				1		1					1		5
	" "	AMSAN	1		1		1		1		1			1		1		1		1		1	10
	Repair Parts Man	SK3			1																		1
	Personnelman	PN3	1													1							2
		Total	7	2	2	3	3	1	4	2	1	3	1	1	3	3	2	3	1	1	3	1	47
		Cumulative Total	7	9	11	14	17	18	22	24	25	28	29	30	33	36	38	41	42	43	46	47	47
																							Maximum Grand Total 127

* Also member of Maintenance Team.
** For continuous 24 hr. boat utilization, totals for operator personnel must be multiplied by a factor of 3.
@ Avia.Maintenance Technician.

APPENDIX C

PROJECTED SURVEY BOAT (TYPES A AND B) MANNING REQUIREMENTS (1-33 boats)

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APPENDIX C

PROJECTED SURVEY BOAT (TYPES A AND B)
MANNING REQUIREMENTS (1-33 boats*)

Location	Billet Title	Rank/ Rate	1-5 Boats	6-12 Boats	13-20 Boats	21-30 Boats	31-33 Boats	Maximum No. Req.
Operating Craft (Crew)	POinC: Coxswain	BM2/3	1-5	6-12	13-20	21-30	31-33	31-33
	**Boat Engineer	EN3/ENFN	1-5	6-12	13-20	21-30	31-33	31-33
	Equip.Oper.	QM2/3	1-5	6-12	13-20	21-30	31-33	31-33
		***Total	3-15	18-36	39-60	63-90	93-99	93-99
Ship Based Maintenance Team	Boat Group Commander	LT					1	1
	Boat Group Div.Off.	ENS					1	1
	Boat Group Maint.Off.	@WO1/2		1				1
	Boat Group PO	BM1		1				1
	Diesel Engine Tech.	ENC			1			1
	" " "	EN1	1					1
	" " "	EN2				1		1
	Marine Hull Repair Spec.	DC1	1				1	2
	" " " "	DC2		1				1
	" " " "	DC3			2	1		3
	" " " "	#SFM/SFP						
	Electrical Spec.	EM2	1					1
	" "	EM3		1	1			2
	Machinist	MR1					1	1
	"	MR2			1	1		2
	"	MR3				1	1	2
	Diesel Eng.Rep.Asst.	FN	1	2	2	2	3	10
	Repair Parts Man	SK3			1			1
	Personnelman	PN3	1				1	2
		Total	5	6	8	6	9	34
		Cumulative Total	5	11	19	25	34	34
						Maximum Grand Total		127 - 133

* Survey Boats - 31' River Patrol Boat (PBR Type); 48' Planing Boat.
** Also member of Maintenance Team.
*** For continuous 24 hr. boat utilization, totals for operator personnel must be multiplied by a factor of 3.
@ Machinist.
# SFP/SFM will not be required unless metal hull boats are used.

APPENDIX D

PROJECTED HELICOPTER (UH-1E) (TYPE HT)
MANNING REQUIREMENTS (1-30 Helos)

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APPENDIX D

PROJECTED HELICOPTER (UH-1E)(TYPE MT)
MANNING REQUIREMENTS (1-30 Helos)

Location	Billet Title	Rank/ Rate	HELICOPTER 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	Max. No. Req.
Squadron Command (See Note)	Comdg. Officer	CDR									1																						1
	Exec.Officer	CDR									1																						1
	A/C Maint.Officer	LCDR									1																						1
	#Maint.Cont.Officer	WO-1									1																						1
		Total									4																						4
Operating Air Craft	Pilot/Co-Pilot	LCDR/LT/ LTJG/ENS	4	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	90
	*Air Crewman	ADJ1	1					1					1						1													1	5
	* " "	ADJ2				1			1						1						1			1							1		6
	* " "	ADJ3		1	1					1	1			1		1	1			1		1			1	1		1	1				13
	* " "	ADJAN					1					1							1				1				1			1			6
	Photographer	PH1	1																														1
	"	PH2		1	1	1																											3
		Total	6	4	5	5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	124
		Cumulative Total	6	10	15	20	24	28	32	36	40	44	48	52	56	60	64	68	72	76	80	84	88	92	96	100	104	108	112	116	120	124	124
Ship Based Maintenance Team	Chf. A/C Maint.Man	AFCM										1																					1
	Avi.Jet Eng. Tech.	ADCS							1													1											2
	" " " "	ADJC			1															1													2
	" " " "	ADJ1																								1							1
	" " " "	ADJ2		1								1					1											1					4
	" " " "	ADJ3																					1								1		2
	" " " "	ADJAN							1						1																		2
	Chf.Avionics Tech.	AVCM																				1											1
	Avi.Elct.Tech.	ATCS																		1													1
	" " "	ATC									1																						1
	" " "	AT1				1									1											1						1	3
	" " "	ATN2		1				1					1						1						1				1				6
	" " "	ATN3	1				1		1					1	1					1			1			1		1					9
	" " "	ATNAN				1					1						1					1					1					1	6
	Avi.Struc.Specl.	AMCS							1																		1						2
	" " "	AMSC														1																	1
	" " "	AMS1	1																		1									1			3
	" " "	AMH1									1																	1					2
	" " "	AMS2				1					1							1							1								4
	" " "	AMH2	1					1													1					1							4
	" " "	AMS3		1				1						1									1					1				1	6
	" " "	AMH3				1												1														1	3
	" " "	AMSAN								1							1										1						3
	" " "	AMHAN													1								1										2
	Avi.Elec.Specl.	AEC												1																			1
	" " "	AE1					1													1													2
	" " "	AE2			1				1						1			1					1				1				1		7
	" " "	AE3	1	1			1				1						1				1			1				1	1				9
	" " "	AEAN						1				1				1						1			1					1			6
	AircrewSurvEqpSpecl	PR1										1																					1
	" " " "	PR2		1																							1						2
	" " " "	PR3						1											1											1			3
	" " " "	PRAN														1							1										2
	AviMaintAdminSpecl	AZ1											1																					1
	" " " "	AZ2							1																1									2
	" " " "	AZ3	1																		1													2
	" " " "	AZAN															1												1					2
	Avi.Supply Specl.	AK1																			1													1
	" " "	AK3			1																													1
	Airman	AN		1		1		1		1		1		1		1		1		1		1		1		1		1		1		1	15
	Admin. Clerk	YN1										1																					1
	" "	YN3																			1													1
	Personnel Clerk	PN2																1																1
	" "	PN3	1																															1
		Total	6	5	4	4	2	4	7	4	2	10	2	3	4	5	5	5	2	5	6	5	6	2	4	5	4	5	4	5	2	5	132
		Cumulative Total	6	11	15	19	21	25	32	36	38	48	50	53	57	62	67	72	74	79	85	90	96	98	102	107	111	116	120	125	127	132	132
		Grand Cumulative Total	12	21	30	39	45	53	64	72	82	96	102	109	117	126	135	144	150	159	169	178	188	194	202	211	215	228	236	245	251	260	260

#Non flying officer.

*Also member of Maintenance Team when not flying. (Each HELO requires a minimum flight crew of 2 officers (pilot and co-pilot) and an enlisted Air Crewman. Additional enumberated pilot/co-pilots are relief personnel (REF: OPNAV INST 05331.3F)).

NOTE: Because of the large number of aircraft involved, Squadron requirements have been added for planning purposes after the 8th helicopter. If a detachment (helicopters supplied and supported by a Squadron located elsewhere) of greater than 8 helicopters is desired, Squadron Command projections outlined here should be subtracted from the totals.

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APPENDIX E

PART 1 - Projected Hydrographic Data Collection Group Manpower Requirements

PART 2 - Projected Hydrographic Chart Compilation Group Manpower Requirements

PART 3 - Projected Graphic Processing and Reproduction Group Manpower Requirements

PART 4 - Projected Hydrographic Survey Detachment Administrative Support Manpower Requirements.

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APPENDIX E - PART 1

Projected Hydropraphic Data Collection
Group Manpower Requirements*

Rank/Rate	No.	NOBC/ NEC	Billet Title	Area of Responsibility
LT/LTJG	3	2330	Hydrographic Survey Control Officer	Controls and directs real time survey operations and data collection. Supervises and directs installation of positioning subsystem and data buoys.
EAC	1	-	Engineering Aid	Assists Hydrographic Survey Control Officer. Performs computer assist functions. Provides navigation system/data buoy equipment positioning support.
EA1	1	-	" "	
EA2	2	-	" "	
EA3	1	-	" "	
DS1	1	16XX	Data Systems Tech.	Performs computer system, peripheral equipment, including analog to digital conversion equipment, maintenance.
DS2	2	16XX	" " "	
DS3	2	16XX	" " "	
ET1	1	-	Electronics Tech.	Repairs and performs technical maintenance for positioning subsystem and data buoy equipment, navigation and communications systems, and ship mounted survey equipment. Assists survey vehicle electronics maintenance personnel.
ETN2	2	-	" "	
TOTAL	16			

Identification of NOBC/NECs:

NOBC-2330 Hydrographic Survey Officer (Hydro Survey)
NEC DS-16XX Data Systems Technician (unidentified computer/peripheral, etc. equip.)

*Based on 24 hour operations.

APPENDIX E - PART 2

Projected Hydrographic Chart Compilation
Group Manpower Requirements*

Rant/Rate	No.	NOBC/ NEC	Billet Title	Area of Responsibility
LCDR	1	2330	OIC; Hydrographic Survey Officer	In charge of overall hydrographic survey and charting detachment. Reviews and evaluates charting workload. Directs and monitors photogrammetric, hydrographic, and cartographic data collection and reproduction activities.
LT/LTJG	3	*	Hydrog./Cartog.	Analyzes photographic-cartographic source material, geodetic information and other source data for chart production. Uses interactive display and other equipment to facilitate smoothing and refining of manuscript data.
EA1	1	-	Engineering Aid	Assists Hydrographer/Cartographer. Performs computer assist functions. Provides navigation system/data buoy equipment positioning support.
EA2	1	-	" "	
EA3	1	-	" "	
DS1	1	16XX	Data Systems Tech.	Performs computer system and peripheral equipment maintenance.
DS2	1	16XX	" " "	
TOTAL	9			

*Not available in Navy manpower inventory.

Identification of NOBC/NECs:

NOBC-2330 Hydrographic Survey Officer (Hydro Survey)
NEC DS-16XX Data Systems Technician (unidentified computer/peripheral equip.)

*Based on 24 hour operations.

APPENDIX E - PART 3

Projected Graphics Processing and Reproduction
Group Manpower Requirements*

Rank/Rate	No.	NOBC/ NEC	Billet Title	Area of Responsibility
LT	1	*	Hydrog./Cartog.	Supervises overall graphic processing and reproduction operations. Analyzes, edits, and revises hydrographic manuscripts. Provides photogrammetric expertise as required.
LTJG	1	*		
LI1	1	-	Lithographer	Accomplishes necessary layout, printing, and plate work. Cleans, lubricates, adjusts, and maintains associated equipment. Operates and maintains process camera and typesetting equipment. DM assists PT and LIs with graphic and art copy work.
LI2	1	-	Lithographer	
DM2	1	-	Illustrator-Draftsman	
PT1	1	-	Photographic Intelligenceman	Processes incoming photographic data. Operates and maintains relevant photographic interpretation and mosaic equipment. Assists in photography processing. Maintains Source Data file. Operates and maintains Graphic Digitizer with DS assistance.
PH1	1	8126	Photographer	Mixes photographic chemicals and solutions for film processing and printing (both color and black and white). Operates, inspects, and maintains cameras, camera control equipment, laboratory equipment and accessories. Assists with chart reproduction and aerial photography.
PH2	1	8192	Photographer	
TOTAL	8			

*Not available in Navy manpower inventory.

Identification of NECs:
PH-8126 Photographic Quality Controlman
PH-8192 Photographic Equipment Repairman

*Based on 24 hour operations.

APPENDIX E - PART 4

Projected Hydrographic Survey Detachment Administrative
Support Manpower Requirements

Rank/Rate	No.	NOBC/ NEC	Billet Title	Area of Responsibility
LT	1	-	Medical Officer	Provides medical support for embarked Hydrographic Survey and charting detachment.
HM1	1	-	Hospital Corpsman	
LTJG/ENS	1	-	Supply & Fiscal Off.	Provides supply and fiscal support for embarked Hydrographic Survey and charting detachment.
DK2	1	-	Disbursing Clerk	
SK2	1	-	Storekeeper	
RM1	1	-	Radioman	Operates radio and on-line cryptographic equipment.
RM2	1	-	Radioman	"
RM3	1	-	Radioman	"
CYN3	1	2505	Naval Intelligence Clerk	Provides cryptographic assistance.
YN1	1	-	Yeoman	Provides embarked Hydrographic Survey and charting detachment administrative support.
TOTAL	10			

NOTE: Cryptographic duties to be assigned to one of the Hydrographic/Cartographic Officers as a collateral duty.

Identification of NECs:

YN-2505 Naval Intelligence Clerk

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APPENDIX F

PROJECTED MANPOWER REQUIREMENTS FOR A
HYDROGRAPHIC SURVEY SHIP (AGS) BASED UPON
REPRESENTATIVE SHIP CANDIDATE CONFIGURATIONS

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APPENDIX F

PROJECTED MANPOWER REQUIREMENTS FOR A
HYDROGRAPHIC SURVEY SHIP (AGS) BASED UPON
REPRESENTATIVE SHIP CANDIDATE CONFIGURATIONS

Department/Billet Title	Rank/ Rate	Diesel Powered		Steam Powered	
		3600 hp (393')	16000 hp (517')	6000 hp (426')	22000 hp (564'-581')
COMMAND AND CONTROL					
Commanding Officer	CAPT	1	1	1	1
EXECUTIVE DEPARTMENT					
Executive Officer	CDR	1	1	1	1
Personnel Officer	LTJG	-	1	-	1
Chaplain	LT	1	1	1	1
Supv. Admin. Clerk	YN1	See Note 1.			
Admin. Clerk	YN2	1	1	1	1
Admin. Clerk	YN3	1	1	1	1
Admin. Clerk Appr.	YNSN	-	1	-	1
Naval Intell. Clerk	CYN3/SN	3	3	3	3
Supv. Pers. Clerk	PN1	See Note 2.			
Personnel Clerk	PN2	-	1	-	1
Personnel Clerk	PN3	1	-	1	-
Pers. Clerk Appr.	PNSN	See Note 3.			
Supv. Postal Clerk	PC2	-	1	-	1
Postal Clerk	PCSN	1	1	1	1
		-	1	-	1
NAVIGATION DEPARTMENT					
Navigator	LT	1	1	1	1
Supv. Quartermaster	QMC	1	1	1	1
Quartermaster	QM2	1	1	1	1
Quartermaster	QM3	1	1	1	1
Quartermaster Trainee	SN/SA	-	1	-	1
OPERATIONS DEPARTMENT					
Operations Officer	LCDR	-	1	-	1
	LT	1	-	1	-
Communications Officer	LTJG	-	1	-	1
	ENS	1	-	1	-
Elect. Material Officer	CWO-2	1	1	1	1
Supv. Radioman	RMC	1	1	1	1
Radioman	RM1	See Note 4.			
Radioman	RM2	3	3	3	3
Radioman	RM3	See Note 5.			
Radioman Appr.	RMSN	2	4	2	4
		See Note 6.			
		3	3	3	3

(continued on next page)

APPENDIX F (Continued)

Department/Billet Title	Rank/ Rate	Diesel Powered		Steam Powered	
		3600 hp (393')	16000 hp (517')	6000 hp (426')	22000 hp (564'-581')
OPERATIONS DEPARTMENT (Cont'd)					
Supv. Visual Comm. Spec.	SM2	1	1	1	1
Visual Comm. Spec.	SM3	2	2	2	2
Visual Comm. Spec. Appr.	SMSN	-	1	-	1
Supv. Radar Oper.	RD1	1	1	1	1
Radar Oper.	RD2	1	1	1	1
Radar Oper.	RD3	1	2	1	2
Radar Oper. Appr.	RDSN	1	2	1	2
Radar Oper. Trainee	SN/SA	-	1	-	1
Supv. Electronics Tech.	ETC	1	1	1	1
Electronics Tech.	ETN2	1	1	1	1
Electronics Tech.	ETR2	1	1	1	1
Electronics Tech.	ETN3	2	2	2	2
Electronics Tech.	ETR3	1	1	1	1
Electronics Tech. Appr.	ETNSN	-	1	-	1
Aerographer	AG2	1	1	1	1
Aerographer	AG3	1	1	1	1
DECK DEPARTMENT					
First Lieutenant	LT	1	1	1	1
Asst. First Lieut.	ENS	1	1	1	1
Deck Div. Watch Officer	ENS	2	2	2	2
		See Note 7.			
Supv. Boatswain's Mate	BMC	1	1	1	1
Boatswain's Mate	BM1	2	2	2	2
Boatswain's Mate	BM2	1	1	1	1
Boatswain's Mate	BM3	2	2	2	2
Facility Maintenanceman	SN	10	15	10	15
Facility Maintenanceman	SA	5	10	5	10
Gun Ordnance Tech.	GMG2	1	1	1	1
Gun Ordnance Tech. Appr.	GMGSN	-	1	-	1
ENGINEERING DEPARTMENT					
Engineer Officer	LT	1	1	1	1
Damage Control Asst./ Repair Officer	LTJG	1	1	1	1
Main Propulsion Asst.	CWO-2	-	-	-	1
Electrical Officer	CWO-2	-	-	1	1
Auxiliary Officer	CWO-2	-	1	-	-

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APPENDIX F (Continued)

Department/Billet Title	Rank/ Rate	Diesel Powered 3600 hp (393')	Diesel Powered 16000 hp (517')	Steam Powered 6000 hp (426')	Steam Powered 22000 hp (564'-581')
ENGINEERING DEPARTMENT (Cont'd)					
Supv. Aux. Mach. Maint.	MM1	-	-	1	1
Aux. Mach. Maint.	MM2	-	-	1	1
Aux. Mach. Maint.	MM3	-	-	1	1
Supv. Int. Comb. Mach. Oper/Repair	ENC	1	1	-	-
Int. Comb. Mach. Oper/Rep.	EN1	2	3	1	1
Int. Comb. Mach. Oper/Rep.	EN2	2	3	2	2
Int. Comb. Mach. Oper/Rep.	EN3	4	5	3	3
Int. Comb. Mach. Oper/Rep. Apprentice	ENFN	3	4	-	-
Int. Comb. Mach. Oper/Rep. Trainee	FN/FA	4	5	2	4
Supv. Steam Sys. Oper.	BTC	-	-	1	1
Steam Systems Oper.	BT1	-	-	1	2
Steam Systems Oper.	BT2	-	1	2	8
Steam Systems Oper.	BT3	1	-	4	5
Steam Systems Oper. Appr.	BTFN	-	-	-	1
Steam Sys. Oper. Trainee	FN/FA	-	-	3	4
Log Room Yeoman	SN	1	1	1	1
Supv. Elect. Sys. Oper/Rep.	EMC	1	1	1	1
Elect. Sys. Oper./Rep.	EM1	1	2	1	2
Elect. Sys. Oper./Rep.	EM2	1	3	1	3
Elect. Sys. Oper./Rep.	EM3	2	3	2	3
Elect. Sys. Oper/Rep Appr.	EMFN	2	2	2	2
Elect. Sys. Oper/Rep. Trainee	FN/FA	-	2	-	2
		See Note 8.			
Supv. Int. Comm. Tech.	IC1	1	1	1	1
Int. Comm. Tech.	IC2	1	2	1	2
Int. Comm. Tech.	IC3	-	1	-	1
Int. Comm. Tech. Appr.	ICFN	1	1	1	1
Supv. Steam Mach. Oper/Rep.	MMCS	-	-	1	1
Steam Mach. Oper/Rep.	MM1	-	-	2	2
Steam Mach. Oper/Rep.	MM2	-	-	3	3
Steam Mach. Oper/Rep.	MM3	-	-	3	3
Steam Mach. Oper/Rep Appr.	MMFN	-	-	1	1
Steam Mach. Oper/Rep Tr.	FN/FA	-	-	9	9
Supv. Hull Maint. Repair	SF1	1	1	1	1
Hull Maint. Repair	SFM3	-	-	-	1
Hull Maint. Repair	SFP3	1	1	1	1
Hull Maint. Repair Trainee	FN/FA	1	2	1	2
Machinery Repairman	MR2	1	1	1	1
Damage Controlman	DC1	1	1	1	1
Damage Controlman	DC3	1	1	2	2
Damage Controlman Appr.	DCFN	-	1	-	1
Boiler Repairman	BR1	-	-	-	1

(continued on next page)

APPENDIX F (Continued)

Department/Billet Title	Rank/ Rate	Diesel Powered 3600 hp (393')	Diesel Powered 16000 hp (517')	Steam Powered 6000 hp (426')	Steam Powered 22000 hp (564'-581')
SUPPLY DEPARTMENT					
Supply Officer	LT				
	LTJG	See Note 9.			
Disbursing Officer	ENS	1	1	1	1
Supv. Supply Accountant	SKC	1	1	1	1
Supply Accountant	SK1	1	1	1	1
Supply Accountant	SK2	See Note 10.			
Supply Accountant	SK3	1	2	1	2
Supply Acct. Appr.	SKSN	1	2	1	2
Supv. Pay Records Admin.	DK2	See Note 11.			
Pay Records Admin.	DK3	-	1	-	1
Pay Records Admin. Appr.	DKSN	1	-	1	-
Commissary Supervisor	CSC	1	1	1	1
Ship's Cook	CS1	1	1	1	1
Ship's Cook	CS2	2	2	2	2
Ship's Cook	CS3	1	2	1	2
Ship's Cook Trainee	SN/SA	2	3	2	3
Wardroom Chef	SD1	1	1	1	1
Wardroom Cook	SD2	1	1	1	1
Wardroom Cook	SD3	3	3	3	3
Food Serviceman	TN/TA	10	10	10	10
Supv. Ship's Serviceman	SH1	1	1	1	1
Ship's Laundryman	SH2	1	1	1	1
Ship's Laundryman	SH3	1	1	1	1
Ship's Barber	SH3	1	1	1	1
Ship's Laundryman Tr.	SN/SA	1	2	1	2
MEDICAL/DENTAL DEPARTMENT					
Medical Officer	LT	See Note 12.			
Dental Officer	LT	1	1	1	1
Supv. Medical Tech.	HM1	See Note 13.			
Medical Tech.	HM3	1	1	1	1
Medical Tech. Appr.	HN	-	1	-	1
Dental Technician	DT2	1	1	1	1
TOTAL		139	184	165	219
	Off.	15	17	16	18
	CPO	8	8	9	9
	ENL	116	159	140	192

(continued on next page)

Note 1. YN1 included with Embarked Survey Team Admin. Support.
Note 2. CYN3 included with Embarked Survey Team Admin. Support.
Note 3. PN3 included with Embarked Survey Vehicle Support.
Note 4. RM1 included with Embarked Survey Team Admin. Support.
Note 5. RM2 included with Embarked Survey Team Admin. Support.
Note 6. RM3 included with Embarked Survey Team Admin. Support.
Note 7. Deck Division Watch Officers required except where provided by Embarked Survey Vehicle detachments.
Note 8. Listed Electrician's Mate (EM) personnel to be supplemented by Embarked Survey Vehicle EMs.
Note 9. Officer included with Embarked Survey Team Admin. Support.
Note 10. SK2 included with Embarked Survey Team Admin. Support.
Note 11. DK2 included with Embarked Survey Team Admin. Support.
Note 12. Officer included with Embarked Survey Team Admin. Support.
Note 13. HM1 included with Embarked Survey Team Admin. Support.

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